SECTION 26 2416

PANELBOARDS

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LANL MASTER SPECIFICATION

When editing to suit project, author shall add job-specific requirements and delete only those portions that in no way apply to the activity (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the ESM Electrical POC.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Delete information within “stars” during editing.

Specification developed for ML-3 projects. For ML-1 / ML-2, additional requirements and QA reviews are required.
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PART 1 GENERAL

1.1 SECTION INCLUDES

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Edit the following articles to match project requirements.
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A. Power panelboards

B. Lighting and appliance branch circuit panelboards

C. Panelboards for instrument and computer loads.

1.2 SUBMITTALS

A. Submit the following in accordance with Section 01 3300, Submittal Procedures:

1. Catalog Data: Submit catalog data describing each type panelboard, accessory item, and component specified. Include data substantiating that materials comply with specified requirements.

2. Shop Drawings: Submit shop drawings for each panelboard including dimensioned plans and elevations and component lists. Include front and side views of enclosure showing overall dimensions, enclosure type, enclosure finish, unit locations, and conduit entrances. Include the following:

a. Enclosure type with details for types other than NEMA Type 1.

b. Bus configuration and current ratings.

c. Short-circuit current rating of panelboard.

d. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

3. Wiring Diagrams: Submit detailing schematic wiring diagrams including control wiring, and differentiating between manufacturer-installed and field-installed wiring.

4. Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, installation, and starting of Product.

5. Operation and Maintenance Instructions: Submit operation and maintenance instructions. Include instructions for testing circuit breakers.

1.3 QUALITY ASSURANCE

A. Comply with the *National Electrical Code* (NEC) for components and installation.

B. Provide products that are listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) for the application, installation condition, and the environment in which installed.

C. Comply with NEMA PB1 *Panelboards* and NEMA AB1 *Circuit Breakers*.

D. Comply with UL 67 *Panelboards*, UL 50 *Cabinets and Boxes*, and UL 489 *Circuit Breakers*.

E. The manufacturer of the panelboards shall be a certified ISO 9001 or 9002 facility.

F. Provide products suitable for operation at 7500 ft. altitude.

1.4 RECEIVING, STORING AND PROTECTING

A. Receive, inspect, handle, and store panelboards according to NECA 1 *Standard Practices for Good Workmanship in Electrical Construction* (ANSI) and NECA 407 *Recommended Practice for Installing and Maintaining Panelboards* (ANSI).

1.5 EXTRA MATERIALS

A. Furnish six spare keys of each type for panelboard cabinet locks.

B. Provide one spray can of touch-up paint that matches panelboard finish.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Alternate products may be accepted; follow Section 01 2500, Substitution Procedures.

2.2 PANELBOARDS, GENERAL REQUIREMENTS

A. Provide UL67 listed and labeled panelboards as indicated on the Drawings and specified in this Section.

B. Provide panelboard cabinets for flush or surface mounted as indicted on the Drawings.

1. Furnish NEMA Type 1 enclosures, except where the Drawings or conditions of installation indicate the following enclosure requirements:

a. NEMA 3R: Raintight

b. NEMA 3S: Raintight and dust tight

c. NEMA 4X: Corrosion-resistant fiberglass enclosure, watertight, dust tight, and resistant to oil and coolant seepage

d. NEMA 12: Dust tight, dripproof, and resistant to oil and coolant seepage.

2. Provide galvanized steel cabinets constructed according to UL 50 requirements.

3. NEMA 1 boxes shall have removable end walls. NEMA 3, 3S, 4X and 12 boxes shall have end walls welded and sealed.

C. Provide trim fronts that meet the strength and rigidity requirements of UL 50.

1. Fronts for surface-mounted panels shall be same dimensions as box.

2. Fronts for flush panels shall overlap boxes at least 1 inch.

3. Fronts shall have ANSI 49 medium gray enamel electro-deposited over cleaned, phosphatized steel.

4. For NEMA 1 panelboards, provide fronts with hinged trim construction having a piano hinge down one side. The front shall contain a smaller lockable door, which when open, shall provide access to all device handles and rating labels. The hinged front, when open, shall provide access to all conductors and wiring terminals. The panelboard door shall open by a

single lockable latch; the entire hinged front trim shall open by removing screws.

5. Provide a metal panelboard directory frame mounted inside the panelboard door.

6. Provide cylindrical tumbler type locks. Provide sliding vault locks with 3-point latching for enclosures more than 48 inches high. Key all lock assemblies alike. Provide two (2) keys with each lock plus spares as required in the Extra Materials paragraph above.

D. Panelboard phase and neutral bus shall be copper. Panelboard bus current ratings shall be determined by heat-rise tests conducted according to UL 67. Panelboards used on 480V and 480Y/277V systems shall have bus insulators and separations rated for 600V.

E. Provide compression type lugs for mains plus all feeder and branch circuits 100 amperes and larger; smaller lugs shall be mechanical type. Provide panelboard box with dimensions as required to accommodate compression lugs.

F. Provide copper or aluminum equipment ground bus that is adequate for feeder and branch circuit equipment ground conductors. Bond ground bus to cabinet.

G. Panelboards having a main circuit breaker shall be NRTL-listed for use as service entrance equipment.

H. Equip panelboards with mounting brackets, bus connections, and necessary appurtenances, for the future installation of circuit breakers in the “spaces” scheduled on the Drawings.

I. Provide panelboards having NRTL-listed short circuit current ratings not less than the available fault current indicated on the Drawings. With the exception of panelboard with a current-limiting main circuit breaker, do not use “series ratings” for circuit breaker interrupting capacities. The short circuit rating for a panelboard without a current-limiting main circuit breaker shall not exceed the lowest interrupting capacity rating of any circuit breaker installed in the panelboard.

J. Provide thermal-magnetic circuit breakers that meet the requirements of UL 489 *Molded Case Circuit Breakers* and NEMA AB 1 M*olded Case Circuit Breakers and Molded Case Switches*.

1. Provide circuit breakers of the type, rating, and features as indicated on the Drawings.

2. Provide 600V-rated two-pole and three-pole circuit breakers for 480V or 480Y/277V systems.

3. Provide circuit breakers with the following minimum NRTL-listed interrupting capacities:

a. 208Y/120V and 120/240V applications: 10,000 amperes, RMS symmetrical

b. 480V and 480Y/277V applications: 14,000 amperes, RMS symmetrical.

4. Do not use tandem circuit breakers.

5. Provide multipole breakers with a common trip.

6. Provide bolt-on type circuit breakers or circuit breakers that connect to the panel bus through positive gripping connector jaws and are secured by an independent mechanical locking device.

K. Provide padlockable handle lock-off devices for each panelboard main circuit breaker and for all two-pole and three-pole circuit breakers.

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Edit the following articles to match project requirements.
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L. Provide the following accessories, modifications, or special features for panelboards as indicated on the Drawings.

1. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from the box.

2. Split Bus: Vertical buses of indicated panels divided into two vertical sections with connections as indicated.

3. Conduit Covers for Surface Mounted Panels: Same gage and finish as panel front with flanges for attachment to panel, wall, and the floor.

4. Contactors in Mains: Mechanically held, with current rating, poles, and connections as indicated on the Drawings.

5. Shunt trip: Shunt-trip main circuit breaker or shunt-trip branch circuit breakers.

6. Control Power Source: Control power transformer of capacity indicated, for contactor shunt trip or other devices. Mount in cabinet of panel indicated. Protect primary with current-limiting fuses. Provide fused protection of control circuits.

7. Extra Gutter Space: Dimensions and arrangement as indicated on the Drawings.

8. Gutter Barrier: Arranged to isolate section of gutter as indicated.

9. Auxiliary Gutter: Conform to UL 870, "Wireways, Auxiliary Gutters and Associated Fittings."

10. Column Type Panelboard Configuration: Narrow cabinet extended as wireway to overhead junction box equipped with ground and neutral terminal buses.

11. Neutral bus rated 200% of the phase bus for high harmonic applications.

12. Subfeed circuit breaker or lug provision as indicated.

13. Feed-Through Lugs: Sized to accommodate feeders indicated.

14. Surge Arresters: Refer to Section [26 4100, Lightning Protection] [26 4116, Lightning Protection for Explosives Facilities].

15. Transient Voltage Surge Suppressors: Refer to Section 26 4123, Lightning Protection Surge Arresters and Suppressors, and Section 26 4313, Transient Voltage Suppressors.

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Edit the following article to match project requirements. “Power panelboard” is a term defined by the NEC. Delete the following article if power panelboards are not required for the Project.
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2.3 POWER PANELBOARDS

A. Provide power panelboards as indicated on the Drawings. Main bus rating for the power panelboards described in this Section shall not exceed 1200 amperes and main circuit breaker frame size shall not exceed 800 amperes.

B. Refer to Section 26 2413, Switchboards, when main bus rating exceeds 1200 amperes or main circuit breaker frame size exceeds 800 amperes.

C. Manufacturers:

1. Cutler-Hammer “PRL3a and PRL4”.

2. General Electric “Spectra” (480Y/277V) and “AQ” (208Y/120V or 120/240V).

3. Siemens “P2, P3, and P4 Series”

4. Square D “I-LINE” (480Y/277V) and “NQOD” (208Y/120V or 120/240V).

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Edit the following article to match project requirements. “Lighting and appliance branch circuit panelboard” is a term defined in the NEC; these products are often called “lighting panelboards” though they may serve loads other than just lighting. Delete if the following article if lighting and appliance branch circuit panelboards are not required for the Project.
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2.4 LIGHTING AND APPLIANCE PANELBOARDS

A. Provide lighting and appliance branch circuit panelboards as indicated on the Drawings.

B. Lighting and appliance branch circuit panelboard enclosures shall be not less than 20 inches or more than 26 inches in width.

C. Manufacturers:

1. Cutler-Hammer “PRL3a” (480Y/277V) and “PRL1a and PRL2a” (208Y/120V or 120/240V).

2. General Electric “Spectra” (480Y/277V) and “AQ” (208Y/120V or 120/240V).

3. Siemens “P2" (480Y/277V) and “P1" (208Y/120V or 120/240V).

4. Square D “I-LINE” (480Y/277V) and “NQOD” (208Y/120V or 120/240V).

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Delete this article if there is no need for isolated ground power systems; refer to Section D5010 in Chapter 7 of the LANL Engineering Standards Manual.
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2.5 PANELBOARDS FOR INSTRUMENT AND COMPUTER LOADS

A. Provide panelboards for 208Y/120V or 120/240V instrument and computer loads.

B. Enclosures shall be not less than 20 inches or more than 26 inches in width.

C. Provide a 200% rated neutral bus.

D. Provide an isolated ground bus in addition to the equipment ground bus. Size isolated ground bus to accept feeder and branch-circuit isolated ground conductors that are the same size as the corresponding circuit phase conductors.

E. Manufacturers:

1. Cutler-Hammer “PRL1a and PRL2a”

2. General Electric “AQ”

3. Siemens “P1"

4. Square D “NQOD”

PART 3 EXECUTION

3.1 EXISTING WORK

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Delete this article when existing construction is not affected.
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A. Disconnect and remove abandoned panelboards.

B. Maintain access to existing panelboards and other installations that are to remain active and to require access. Modify installation or provide access panel.

C. Clean and repair existing panelboards that are to remain or be reinstalled.

3.2 EXAMINATION

A. Examine surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the control system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install panelboards where indicated on the Drawings and according to manufacturer's instructions, NECA 407, and the *NEC*. Have the manufacturer’s installation instructions available at the construction site.

B. Provide supports in accordance with the requirements of Section 26 0529 Hangers and Supports for Electrical Systems

C. Ground and bond panelboards as required in Section 26 0526 Grounding and Bonding for Electrical Systems.

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Edit the following article to match project requirements.
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D. At flush panelboards install four 1-inch conduits to junction boxes in accessible ceiling space or space designated to be ceiling space in future. [Install four 1-inch conduits to junction boxes in raised floor space.] Install branch circuit conductors from panelboard spare circuit breakers to junction boxes for future extension.

E. Install an auxiliary gutter with permanently installed terminal blocks where a panel is tapped to a riser at an intermediate location.

3.4 IDENTIFICATION

A. Provide typed circuit directories for each branch circuit panelboard. Revise directories to reflect circuiting changes required to balance phase loads.

1. Provide one hard copy and an electronic copy of the panelboard schedule to the Facility Manager at project closeout.

2. Install a plastic-laminated copy of the circuit directory on the inner side of the panelboard door.

B. Identify panelboards and install warning signs and arc-flash warning labels as required in Section 26 0553, Identification for Electrical Systems.

C. Mark floor in front of panelboards to show *NEC* required working space according to Section 26 0553, Identification for Electrical Systems..

3.5 FIELD QUALITY CONTROL

A. Clean, inspect, test, and energize installed panelboards in accordance with NECA 407.

B. After completing installation, cleaning, and testing, touch up scratches and mars on finish to match original finish.

3.6 LOAD BALANCING

A. After Substantial Completion, but not more than two months after Final Acceptance, conduct load-balancing in accordance with NECA 407 and as follows:

1. Do measurements during period of normal working loads as advised by the User.

2. Make load-balancing circuit changes outside the normal occupancy/working schedule of the facility. Arrange with User to avoid disrupting critical services.

3. Recheck loads after circuit changes during a normal load period. Record all load readings before and after changes and submit test records.

END OF SECTION

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Do not delete the following reference information.
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FOR LANL USE ONLY

This project specification is based on LANL Master Specification 26 2416 Rev. 0, dated January

6, 2006.